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Surveying for Spotted Owls in the Northeastern Portion of North Cascades National Park Service Complex, 2009-2010 :

Report for the 2009 Field Season

Natural Resource Technical Report NPS/NCCN/NRTR—2010/334

ON THE COVER
Northern Spotted Owl
Photograph by: Mandy Holmgren

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Natural Resource Technical Report NPS/NCCN/NRTR—2010/334

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Contents

Figures

Tables

Page

Executive Summary

This public version has had information relating to locations of Spotted Owl (listed species) removed. To obtain the original report containing all information it is required to contact the National Park Service author and sign a confidentiality agreement.

Northern Spotted Owl populations have declined over the last century, and the subspecies has been listed by the federal government as "threatened" since 1990. The status of the northern Spotted Owl has not been well documented in the North Cascades of Washington and southwestern British Columbia. In 1993, National Park Service (NPS) resource management staff initiated the first comprehensive inventory of Spotted Owls in suitable habitat within North Cascades National Park Service Complex (NOCA), a four-year survey that identified 11 active Spotted Owl territories in NOCA.

During the ten years following completion of NOCA's 4-year baseline owl inventory in 1996, only sporadic compliance-related owl surveys occurred. More comprehensive, up-to-date information on the status of the park's Spotted Owl population was needed to aid NPS managers updating NOCA's Fire Management Plan and other management and compliance related activities. In response to these needs, NPS partnered with The Institute for Bird Populations to initiate a multi-year study of the status of the NOCA's Spotted Owl population. The project has three main objectives:

1. Revise NOCA's model of suitable habitat for Spotted Owl and develop a revised GIS map layer showing suitable Spotted Owl habitat throughout the park.

2. Resurvey transects that were established and surveyed from 1993 through 1996; locate active Spotted Owl territories, estimate relative abundance, and determine productivity at all activity sites found.

3. Develop individual Spotted Owl activity site management plans with recommendations for protection measures for both currently active and historic sites.

During the first year of the project, we revised NOCA's model of suitable Spotted Owl habitat, in completion of Objective 1 (Wilkerson and Siegel 2007).

During 2007 and 2008 we conducted fieldwork throughout the Stehekin River watershed and along Lake Chelan within Lake Chelan National Recreation Area (Siegel et al. 2008), in completion of Objective 2 for the portion of NOCA that lies east of the Cascades crest. We also began drafting Spotted Owl activity site management plans for currently active and historic Spotted Owl activity sites throughout the portion of NOCA that we surveyed in 2007-2008.

In 2009 we began a two-year effort to complete Objective 2 for the upper Skagit River watershed in NOCA. Year 1 (2009) focused on the northeastern portion of the watershed, including the Newhalem Creek, Panther Creek, Ross Lake, Ruby Creek, and Thunder Creek drainages. This report details our results from spring and summer 2009, the first field season of our current efforts in this portion of the park. We surveyed transects throughout the five selected drainages,

using survey procedures that were virtually identical to those used during the 1990s survey, and our 2007-2008 surveys in the greater Stehekin and Lake Chelan areas.

In 2009 we completed 75 visits to 38 survey transects, amounting to 1,270 2-min or 10-min station surveys, plus 13 follow-up visits to historic Spotted Owls activity sites. None of our transect surveys during the 2009 field season yielded Spotted Owl detections, but our follow-up visits to sites with historical detections confirmed at least one resident Spotted Owl.

Although our survey was designed specifically to detect Spotted Owls, we also documented all detections of other owl species. Throughout the season, we observed and documented individuals of five additional owl species: Great Horned Owl (2 detections, likely representing a single activity site), Barred Owl (69 detections, representing an estimated 18 activity sites), Western Screech-Owl (2 detections, at distinct sites), Northern Pygmy-Owl (7 detections, likely representing 6 distinct sites), and Northern Saw-whet Owl (8 detections, likely representing 5 distinct sites).

We have only completed half of our survey work on this two-year project to survey the northeastern portion of NOCA, so reaching conclusions about changes in the distribution or abundance of owls in the study area is premature. Nevertheless, two preliminary findings are striking:

- One historical Spotted Owl territory no longer appears to be occupied.

- Since the previous extensive owl survey was completed in 1996, Barred Owls have densely colonized the east side of Ross Lake. We found perhaps 11 Barred Owl activity sites east of Ross Lake and north of Highway 20, compared with just 3 activity sites identified along the same survey transects in the early 1990s.

During the 2010 breeding season we will complete our survey efforts in the northeastern portion of NOCA, allowing us to make firmer conclusions about the status of Spotted Owl in the area, and develop management plans for historical and current Spotted Owl activity sites.

Acknowledgments

We are grateful to our hardworking 2009 field crew: Jordan Bell, Joanna Gehrig, Eric Huston, Kara Kuhlman (crew leader), Juan Pablo Medina, Kyle Piete, and Michelle Toshack. We thank Roger Christophersen for sharing his knowledge of the park's owls; Greg Drum for arranging boat rides on Ross Lake and supporting the field crew in numerous ways; and Kelly Bush, Rosemary Seifried, and the other rangers at the Wilderness Information Center in Marblemount for providing logistical advice and updates on trail and campground conditions. We thank Phil Nott and Tom Hamer for their review and thoughtful suggestions on improving this report. Ron Holmes helped format this report to NPS technical report standards. We thank Regina Rochefort for managing peer review for this report. Finally, we thank Carol Beidleman and the Park Flight Migratory Bird Program for coordinating Juan Pablo Medina's visit from Mexico. This is Contribution No. 382 of The Institute for Bird Populations.

Introduction

The northern Spotted Owl (*Strix occidentalis caurina*) occupies mature/old-growth conifer forest that has a multi-layered, multi-species canopy with moderate to high canopy closure (USFWS 2007). One of three subspecies, the northern Spotted Owl occurs from southwestern British Columbia through the Cascade Range and coastal mountains of Washington and Oregon to northern California, including the coastal ranges to just north of San Francisco (Gutiérrez et al. 1995). The Spotted Owl is relatively long-lived, has a long reproductive life span, and exhibits high adult survivorship compared to other owl species (Gutiérrez et al. 1995).

Northern Spotted Owl populations have declined over the last century (Gutiérrez 1995). In June 1990, the U.S. Fish and Wildlife Service (USFWS) listed this subspecies as "threatened" (USFWS 1990). Major reasons for population declines cited include habitat loss or alteration of mature and old-growth forests due to logging, urbanization, and changes in fire regimes (Thomas et al. 1990). The invasion of Barred Owls (*Strix varia*) into Spotted Owl habitat over the past several decades also has contributed to declines in Spotted Owl abundance through competition for nesting habitat and prey (Hamer 1988, Dunbar et al. 1991, Gutiérrez et al. 1995, Kelly et al. 2003, Pearson and Livezey 2003, Hamer et al. 2007, USFWS 2007). Recent demographic data suggest that populations over the 14 long-term demographic study areas in Washington, Oregon, and California decreased by about 3.7 percent annually from 1985 to 2003 (Anthony et al. 2004).

The status of the northern Spotted Owl has not been well documented in the North Cascades of Washington and southwestern British Columbia. Past efforts to assess the status of Spotted Owls within North Cascades National Park Service Complex (NOCA) began in the early 1980s when random calling surveys were initiated by the Washington Department of Fish and Wildlife (WDFW). Only a few of the random survey transects actually entered NOCA boundaries and no Spotted Owls were detected in NOCA from these surveys (Washington Department of Fish and Wildlife, Ann Potter, wildlife biologist, 1996, pers. comm.). Other surveys conducted by NOCA biologists were conducted in conjunction with environmental assessments of NPS operations (NOCA files). No Spotted Owls were detected during these surveys either. Throughout most of the 1990s, biologists from the National Council of the Paper Industry for Air and Stream Improvement, Incorporated (NCASI), completed reconnaissance-level surveys in the Stehekin Valley while conducting Spotted Owl investigations on U.S. Forest Service (USFS) lands adjacent to NOCA (National Council of the Paper Industry for Air and Stream Improvement, Incorporated, Tracey Fleming, 2005, unpubl. data). The NCASI surveys stopped in the late 1990s due to lack of funding. In 1993, National Park Service (NPS) resource management staff initiated a comprehensive inventory of Spotted Owls in suitable habitat within NOCA. This 4-year survey, the first systematic survey of Spotted Owl habitat completed in the park (Kuntz and Christophersen 1996), identified 11 Spotted Owl activity sites within NOCA, and confirmed pair occupancy at 6 of the sites.

During the 10 years following completion of NOCA's 4-year baseline owl inventory in 1996, only sporadic compliance-related owl surveys occurred. Acquisition of updated information on the status of the park's Spotted Owl population was needed to aid NPS managers updating NOCA's Fire Management Plan and other management and compliance related plans. In response to these needs, NPS partnered with The Institute for Bird Populations to initiate a multi-

year study of the status of NOCA's Spotted Owl population. The project has three main objectives:

1. Revise NOCA's model of suitable habitat for Spotted Owl and develop a revised GIS map layer showing suitable Spotted Owl habitat throughout the park.

2. Resurvey transects that were established and surveyed between 1993-1996 to locate active Spotted Owl territories, estimate relative abundance, and determine productivity at all activity sites found.

3. Develop individual Spotted Owl activity site management plans with recommendations for protection measures for both currently active and historic sites.

During the first year of the project, we revised NOCA's model of suitable Spotted Owl habitat, in completion of Objective 1 (Wilkerson and Siegel 2007).

During 2007 and 2008 we conducted fieldwork throughout the Stehekin River watershed and along Lake Chelan within LACH (Siegel et al. 2008), in completion of Objective 2 for the portion of NOCA that lies east of the Cascades crest. We also began drafting Spotted Owl activity site management plans for currently active and historic Spotted Owl activity sites throughout the portion of NOCA that we surveyed in 2007-2008.

In 2009 we began a two-year effort to complete Objective 2 for the upper Skagit River watershed within NOCA. Year 1 (2009) focused on northeastern portion of the watershed, including the Newhalem Creek, Panther Creek, Ross Lake, Ruby Creek, and Thunder Creek drainages. This report details our results from the first (2009) field season of this work.

Study Area

The North Cascades National Park Service Complex (NOCA) includes North Cascades National Park, Lake Chelan National Recreation Area, and Ross Lake National Recreation Area. NOCA is located in the North Cascades physiographic province in northwestern Washington. Fieldwork during the 2009 field season was confined to the northeastern portion of NOCA (Fig. 1), specifically the Newhalem Creek, Panther Creek, Ross Lake, Ruby Creek, and Thunder Creek drainages.

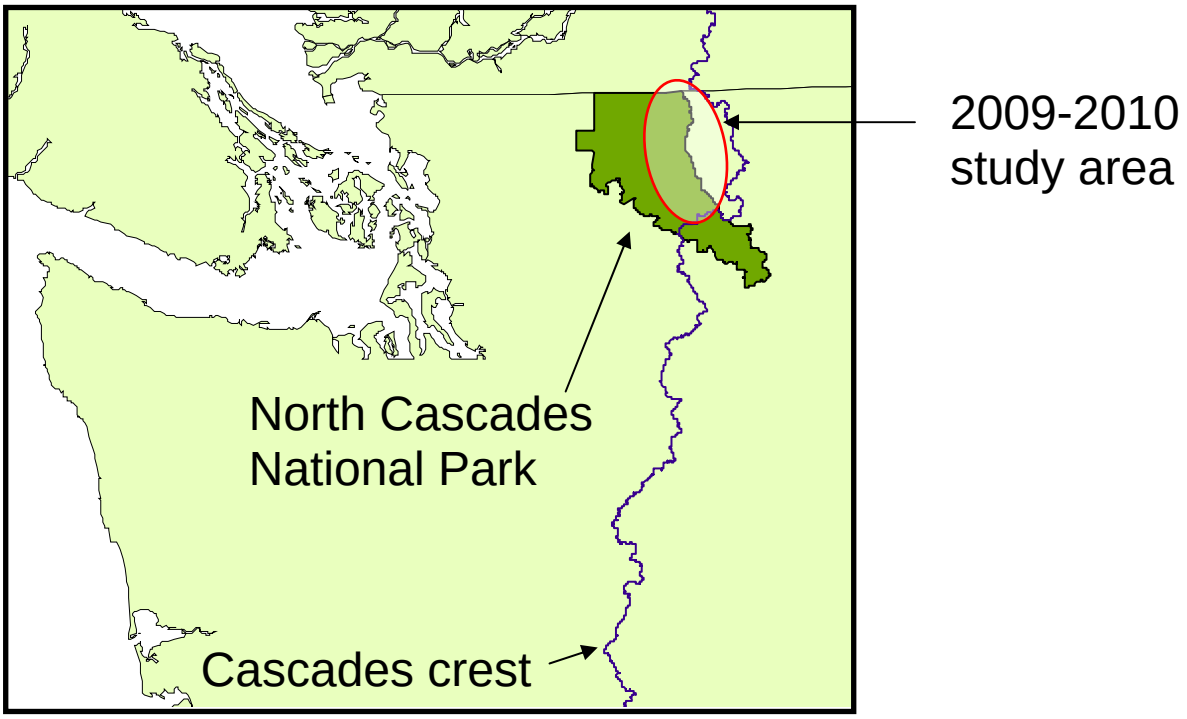

Figure 1. Portion of North Cascades National Park Service Complex (NOCA) targeted for Spotted Owl surveys during the 2009 and 2010 breeding seasons.

Methods

Survey Design

For our 2009 field season, we sought to re-survey about half of the transects in the northeastern portion of the park that were established and surveyed by Kuntz and Christopherson (1996) in the early 1990s. Transects generally consisted of 8 to 12 survey stations placed at 400-m intervals in areas of suitable habitat, at all elevations. Survey stations were placed along trails and at off-trail locations. Whenever possible, stations were placed along ridges and away from streams to maximize coverage by enhancing sound transmission.

To minimize travel time between transects, we selected about half of the drainages in our study area, and sought to survey all the transects in those drainages during 2009. Transects in the remaining drainages will be surveyed in 2010. We selected the Newhalem Creek, Panther Creek, Ross Lake, Ruby Creek, and Thunder Creek drainages for surveys in 2009.

Crew training and certification

At the start of the field season (beginning on April 1), we provided the crew with an intensive week-long training session, that focused on owl calling, owl identification, orienteering, first aid and backcountry safety, and data collection procedures. By the end of the week all crew members could confidently perform all the tasks necessary to conduct surveys.

Data collection

Most agencies conducting Spotted Owl surveys in the Pacific Northwest use six survey visits to determine annual pair occupancy and reproductive status within a defined geographical location (USFWS 1992). This standard was developed mainly for use in determining Spotted Owl presence/absence in areas where management actions that could affect Spotted Owls (such as logging or road construction) are planned. Since our objective was to find as many activity sites as possible, mostly in areas without imminent management activities that would jeopardize owls, we chose to deviate from the standard protocol for most transects by only surveying two or three times in order to maximize coverage of potential habitat in the park. We realize this may have caused us to miss detections of some occupied activity sites. However, results from surveys conducted at Olympic National Park showed there was a high probability of detecting at least one member of a resident pair during the first three visits to an occupied territory and most owl pairs were detected on the first visit (Seaman et al. 1992).

Spotted Owl surveys are usually conducted at night, when owls are more active and are thought to be more responsive to standard survey techniques (USFWS 1992). Because much of our study area is in remote, rugged backcountry, the location of transects influenced the time of day we conducted them. We surveyed off-trail transects during daylight hours to provide a safer working environment for field crews. We surveyed trail and road transects at night, beginning no earlier than 30 minutes after official sunset. We conducted our first 2009 field survey on April 2 and our last field survey was completed on June 27.

Data collection procedures were virtually identical to those used by Kuntz and Christophersen (1996) and Siegel et al. (2008). Technicians conducted a series of ten-minute surveys placed every 400 m along each transect. Two-minute point surveys were conducted at the mid-point (200 m) between ten-minute stations. We used standard methods for locating Spotted Owls

(Forsman 1983). Using a series of vocal imitations of Spotted Owl calls—a mix of three-note or four-note location calls and series calls—technicians hooted at the surveys stations. For both the 10- and 2-minute surveys, technicians hooted once every thirty seconds, except that the frequency was reduced to once every minute during the last three minutes of the 10-minute surveys.

When a Spotted Owl was detected, observers attempted to locate the owl to determine its sex, age, and if the owl was banded, band colors and band positions. Using standard mousing techniques (Forsman 1983), Spotted Owls would then be monitored throughout the season to determine pair status and locate nests and juveniles. We also documented detections of any other owl species detected during transect surveys or at any other time during the field season.

We originally hoped to survey each of the transects in our selected drainages three times, consistent with the methods we used in the greater Stehekin River and Lake Chelan watersheds on the east side of NOCA (Siegel et al. 2008). However, this level of sampling effort proved to be unworkable with our small field crew because:

- at the beginning of the field season, park law enforcement officials advised us not to assign crew members to survey transects alone at night—not even transects that lay entirely on-trail—due to safety concerns stemming from recently discovered marijuana growing activities in the area; and

- three of our five crew members sustained injuries that left them unable to work to their full capacity for at least part of the field season.

We therefore curtailed our protocol such that most of the transects we surveyed in 2009 were only visited twice, rather than three times, with a few exceptions as noted below. We also conducted historical follow-up visits to sites in our selected drainages where Spotted Owls had been detected at any time since 1993:

Historical follow-up visits involved two or more technicians visiting areas with historical detections during daylight (but near dawn or dusk, if possible) and spending a minimum of 4 person-hours walking throughout the area, calling, listening, and watching for owl sign (whitewash, pellets, etc.).

Results

In 2009, we completed 75 surveys of 38 transects, comprising 1,270 2-min or 10-min station surveys plus 13 follow-up visits to three historic Spotted Owls activity sites.

Spotted Owl detections and activity sites

None of our transect surveys during the 2009 field season yielded Spotted Owl detections, and we detected just one Spotted Owl during our follow-up visits to the three sites with historical detections (Table 1, Fig. 2).

Table 1. Results of follow-up surveys at historical Spotted Owl activity sites surveyed during the 2009 field season in North Cascades National Park.

Table 1. removed from this public version to protect listed species locations.

Figure 2. removed from this public version to protect listed species locations.

Figure 2. Historic Spotted Owl activity sites surveyed with 'follow-up visits' during the 2009 Spotted Owl survey at North Cascades National Park. Red square indicates the only Spotted Owl detection recorded during the 2009 field season. Green lines indicate Spotted Owl survey transects surveyed in 2009; dashed black lines indicate trails; thin black lines indicate roads; thick black lines indicate park boundaries.

Below we detail survey effort and results from our follow-up visits and transect surveys.

Historic Activity Center 1

Despite intensive search efforts, including six follow-up visits, we did not find Spotted Owls in this historic territory. We did, however, discover a Barred Owl activity site in the same area as the southernmost grouping of recorded Spotted Owl detections. We did not determine Barred Owl breeding status at the site. After we found the Barred Owl, we focused our efforts on the two northern detection groupings of the historic Spotted Owl activity center.

Historic Activity Center 2

We detected no Spotted Owls at this historic activity site. High water made crossings dangerous, so we were unable to reach the western portion of the historic activity site. Rather, all follow-up visits were focused around the eastern portion of the site. We conducted three full follow-up visits, and a fourth that was cut short due to a crew injury. We detected a Barred Owl and found what was believed to be a *Strix* pellet within 200 m of the site. The crew noted that the area contained excellent stands of old-growth western redcedar (*Thuja plicata*)and western hemlock (*Tsuga heterophylla*).

Historic Activity Center 3

We detected a Spotted Owl during our third and final historic follow-up visit on morning of June, 27 2009. The owl responded to hooting, giving location calls at one to two minute intervals, which allowed the surveyor to visually locate the perched owl. The owl was observed roosting (preening occasionally and appearing to sleep) in a large western hemlock, for over three hours. A mouse was offered, but the owl showed no interest. The roost site could possibly be a nest tree, though a nest was not located and no obvious signs of nesting were observed. The observer was unable to determine the sex of the owl, and the owl's legs were not visible, so no bands could be seen. The detection was made on our final day of fieldwork for the season, so no further follow-up work could be conducted.

Detections of other owl species

While surveying transects, hiking to transects, and backcountry camping, our field crew documented their observations each time they detected owls of any species. During the 2009 field season we detected and documented five owl species in addition to Spotted Owl: Great Horned Owl, Barred Owl, Western Screech-Owl, Northern Pygmy-Owl, and Northern Saw-whet Owl.

Great Horned Owl

We twice (once while surveying the Roland Point transect and once as an incidental detection at nearly the same location) detected a single Great Horned Owl representing one activity site near Roland Point (Table 2, Fig. 3). No other Great Horned Owls were detected this season.

Table 2. Great Horned Owl activity sites identified during the 2009 Spotted Owl survey in North Cascades National Park.

Activity Site Code[a]	Location Description	Breeding Status	Breeding Status Notes
A	Roland Point	Unknown	

[a] Letters correspond to those in Figure 3.

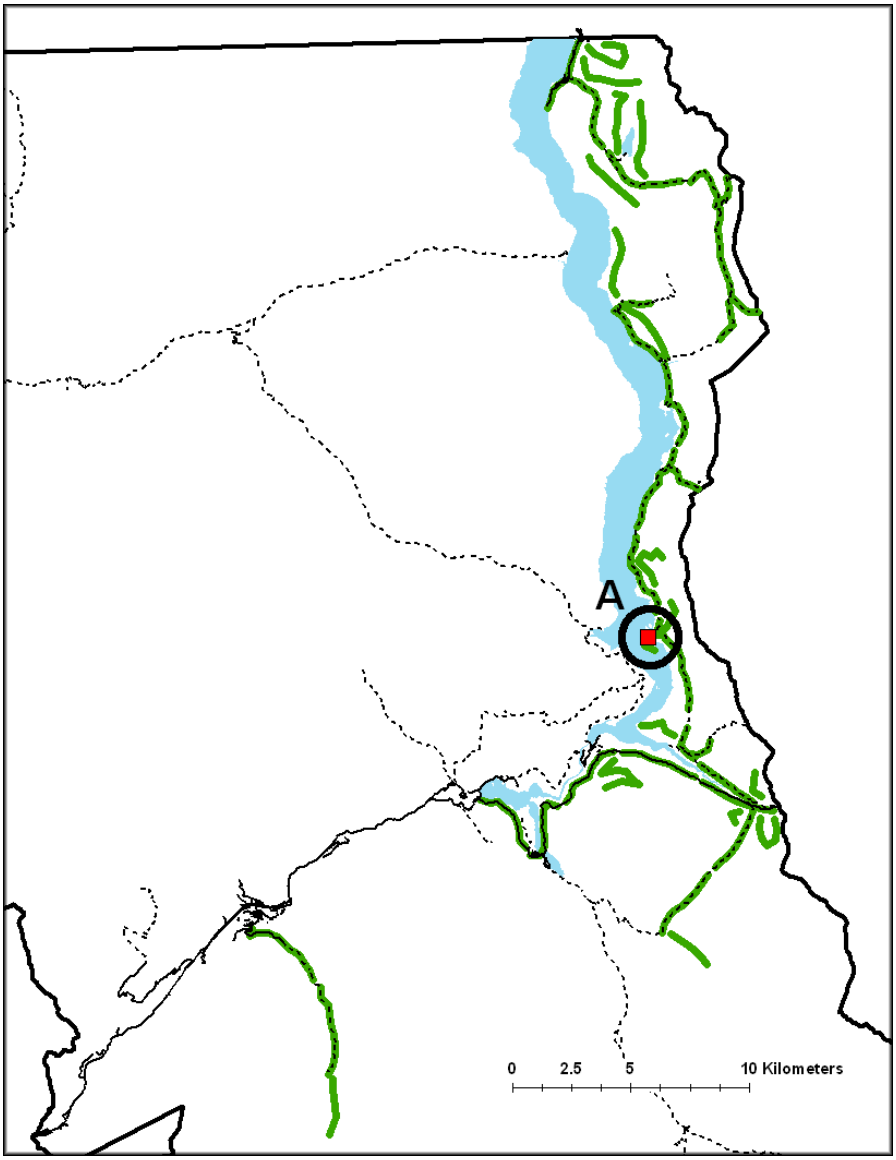

Figure 3. Location of Great Horned Owl detections recorded during the 2009 Spotted Owl survey in North Cascades National Park. Red squares indicate individual Great Horned Owl detections (there are two in the figure, but they almost entirely overlap). Lettered black circle groups the detections according to our best guess of the number of distinct territories represented by the detections, but is not intended to indicate territory size; see Table 2 for more information. Green lines indicate Spotted Owl survey transects; dashed black lines indicate trails; thin black lines indicate roads; thick black lines indicate park boundaries.

Barred Owl

We documented sixty-nine Barred Owl detections representing an estimated 18 activity sites, including nine confirmed pairs (Table 3, Fig. 4). Activity sites with confirmed pairs, where a male and female were observed calling in chorus, include: Highway 20 I (near Thunder Lake), Panther Creek Trail II (near 4th of July Pass), Happy Creek, East Bank Trail IV (near Hidden Hand Pass), Roland Point, East Bank Trail III (near Rainbow Point), East Bank Trail II (near Devil's Creek), Lightning Creek Trail II (near Hozomeen Lake), and Hozomeen Road (near the Hozomeen bunkhouse). The pair at Happy Creek was not heard calling in chorus, but both the

male and female were detected on separate visits. There were also detections of Barred Owl pairs on the Canadian Border East and Devils Creek Trail transects, which we believe to be the same pairs that we detected on Hozomeen Road and East Bank Trail II, respectively. At least one juvenile was confirmed to have fledged from the East Bank Trail III site.

Table 3. Barred Owl activity sites identified during the 2009 Spotted Owl survey in North Cascades National Park.

Activity Site Code[a]	Location Description	Breeding Status	Breeding Status Notes
A	Hozomeen Road	Pair	Male and female detected
B	Lightning Creek Trail I	Pair	Male and female detected
C	Lightning Creek Trail II	Pair	Male and female detected
D	Desolation Bench	Unknown	
E	East Bank Bench	Unknown	
F	Lightning Creek Trail V	Unknown	
G	East Bank Tail I	Unknown	
H	East Bank Trail II	Pair	Male and female detected
I	East Bank Trail III	Fledged young	Male, female, and one juvenile detected
J	Roland Point	Pair	Male and female detected
K	East Bank Trail IV	Pair	Male and female detected
L	Ruby Creek Trail Lower	Unknown	
M	Happy Creek	Pair	Male and female detected
N	Panther Creek Trail II	Pair	Male and female detected
O	Thunder Lake	Pair	Male and female detected
P	Highway 20 I	Unknown	
Q	Stetattle Creek	Unknown	
R	Newhalem Creek Upper	Unknown	Probable pair but not confirmed

[a] Letters correspond to those in Figure 4.

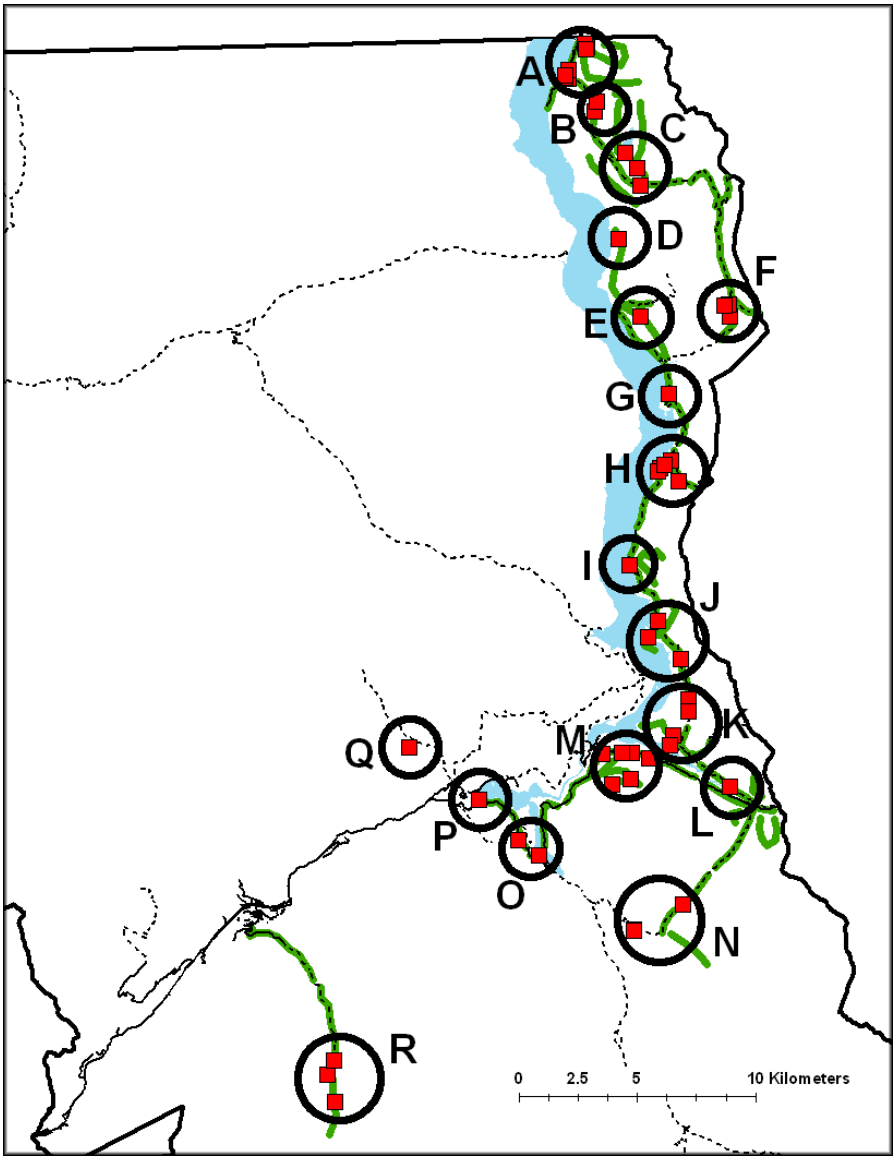

Figure 4. Location of Barred Owl detections (red squares) recorded during the 2009 Spotted Owl survey in North Cascades National Park. Lettered black circles group the detections according to our best guess of the number of distinct territories represented by the detections, but are not intended to indicate territory size; see Table 3 for more information. Green lines indicate Spotted Owl survey transects; dashed black lines indicate trails; thin black lines indicate roads; thick black lines indicate park boundaries.

Other transects with repeated Barred Owl detections, but no confirmed pair status, include Newhalem Creek Trail Upper and Lightning Creek Trail V (near the Deer Lick Cabin). The remaining activity sites indicated in Figure 4 represent single Barred Owl detections.

Western Screech-Owl

We detected two Western Screech-Owls, representing two activity sites (Table 4, Fig. 5). A single detection was made from the Hidden Hand campground near Ruby Creek Trail Upper. A second individual was detected on two occasions along the Lightning Creek Trail I transect near station 6.5.

Table 4. Western Screech-Owl activity sites identified during the 2009 Spotted Owl survey in North Cascades National Park.

Activity Site Code[a]	Location Description	Breeding Status	Breeding Status Notes
A	Hidden Hand Campground	Unknown	
B	Lightning Creek Trail I	Unknown	

[a] Letters correspond to those in Figure 5.

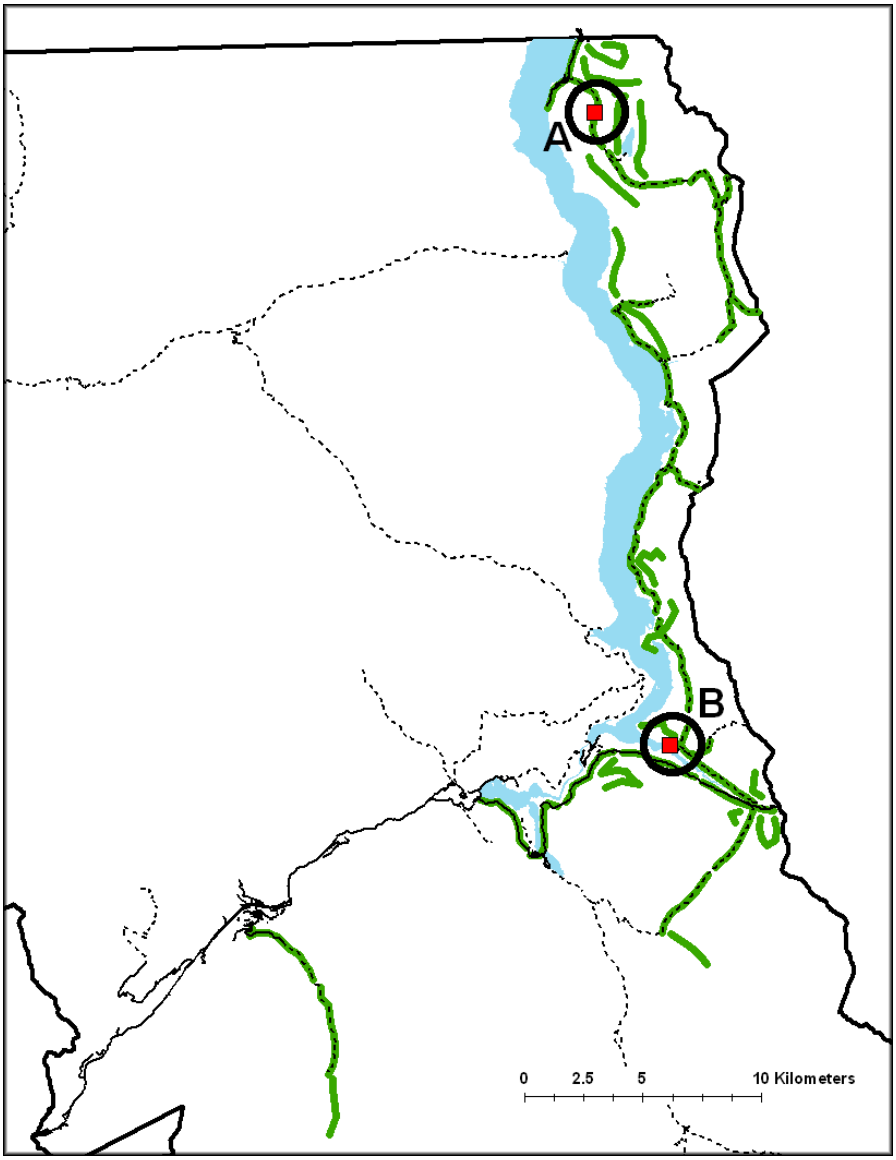

Figure 5. Location of Western Screech-Owl detections recorded during the 2009 Spotted Owl survey in North Cascades National Park. Red squares indicate individual detections Lettered black circles group the detections according to our best guess of the number of distinct territories represented by the detections, but are not intended to indicate territory size; see Table 4 for more information. Green lines indicate Spotted Owl survey transects; dashed black lines indicate trails; thin black lines indicate roads; thick black lines indicate park boundaries.

Northern Pygmy-Owl

We documented seven Northern Pigmy Owl detections, representing six activity sites (Table 5, Fig. 6). Single detections were recorded during surveys of the Ruby Arm, Roland Point, and Howlett Creek transects, and incidental detections of single birds were recorded along the Ruby Creek Trail Lower and Newhalem Creek East transects. We heard two individuals calling simultaneously on the East Bank Bench transect.

Table 5. Northern Pygmy-Owl activity sites detected during the 2009 Spotted Owl survey in North Cascades National Park.

Activity Site Code[a]	Location Description	Breeding Status	Breeding Status Notes
A	Howlett Creek	Unknown	
B	East Bank Bench	Pair	Two owls heard duetting
C	Roland Point	Unknown	
D	Ruby Arm	Unknown	
E	Ruby Creek Trail Lower	Unknown	
F	Newhalem Creek East	Unknown	

[a] Letters correspond to those in Figure 6.

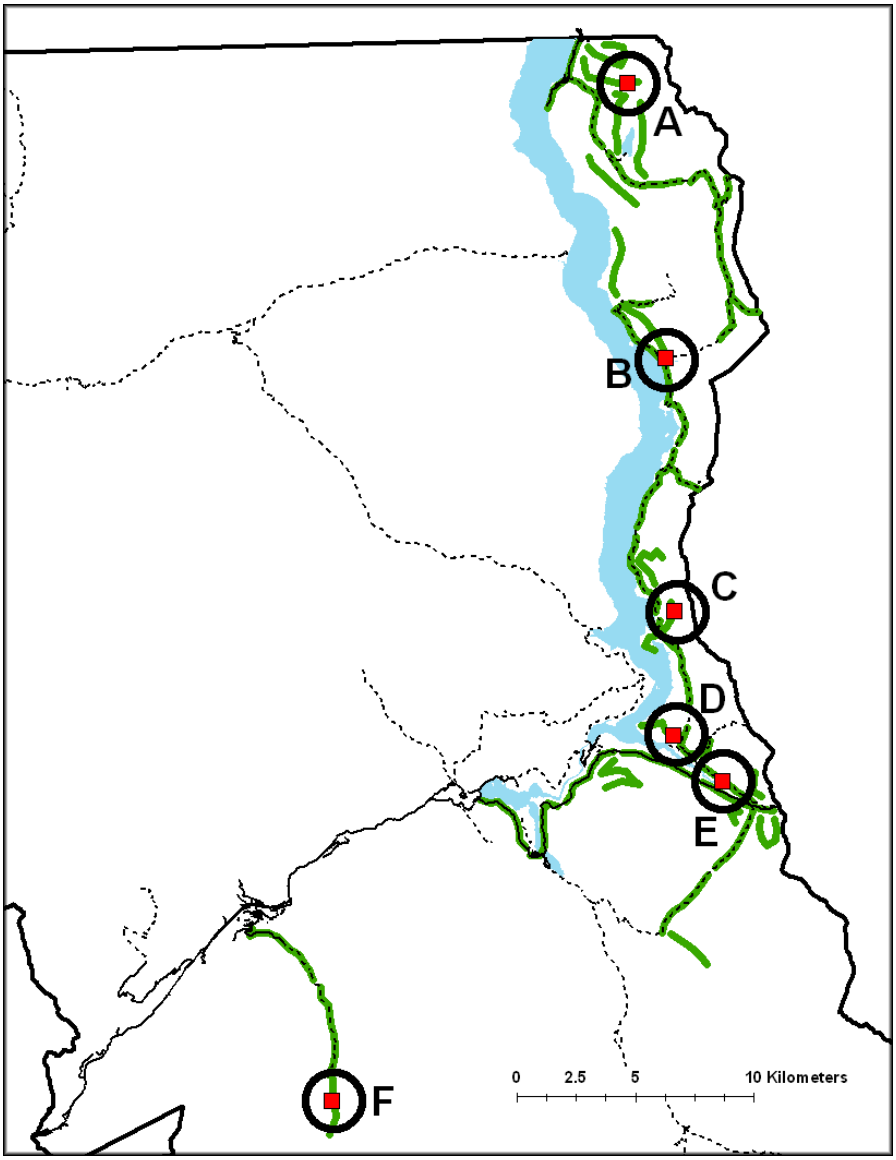

Figure 6. Location of Northern Pygmy-Owl detections (red squares) recorded during the 2009 Spotted Owl survey in North Cascades National Park. Lettered black circles group the detections according to our best guess of the number of distinct territories represented by the detections, but are not intended to indicate territory size; see Table 5 for more information. Green lines indicate Spotted Owl survey transects; dashed black lines indicate trails; thin black lines indicate roads; thick black lines indicate park boundaries.

Northern Saw-whet Owl

We documented eight Northern Saw-whet Owl detections, representing up to five activity sites (Table 6, Fig. 7). One individual (perhaps the same bird) was detected during each of three surveys of the Highway 20 IV transect. The remaining detections were all of single owls along transects Highway 20 V, Ruby Creek Trail Lower, Devil's Creek Trail, East Bank Trail I, and Canadian Border East. Given the close proximity of the detections on Ruby Creek Trail Lower and Highway 20 V, we believe they represent a single activity site, distinct from the Highway 20 IV activity site.

Table 6. Northern Saw-whet Owl activity sites detected during the 2009 Spotted Owl survey in North Cascades National Park.

Activity Site Code[a]	Location Description	Breeding Status	Breeding Status Notes
A	Canadian Border East	Unknown	
B	East Bank Trail I	Unknown	
C	Devil's Creek Trail	Unknown	
D	Highway 20 IV	Unknown	
E	Highway 20 V	Unknown	

[a] Letters correspond to those in Figure 7.

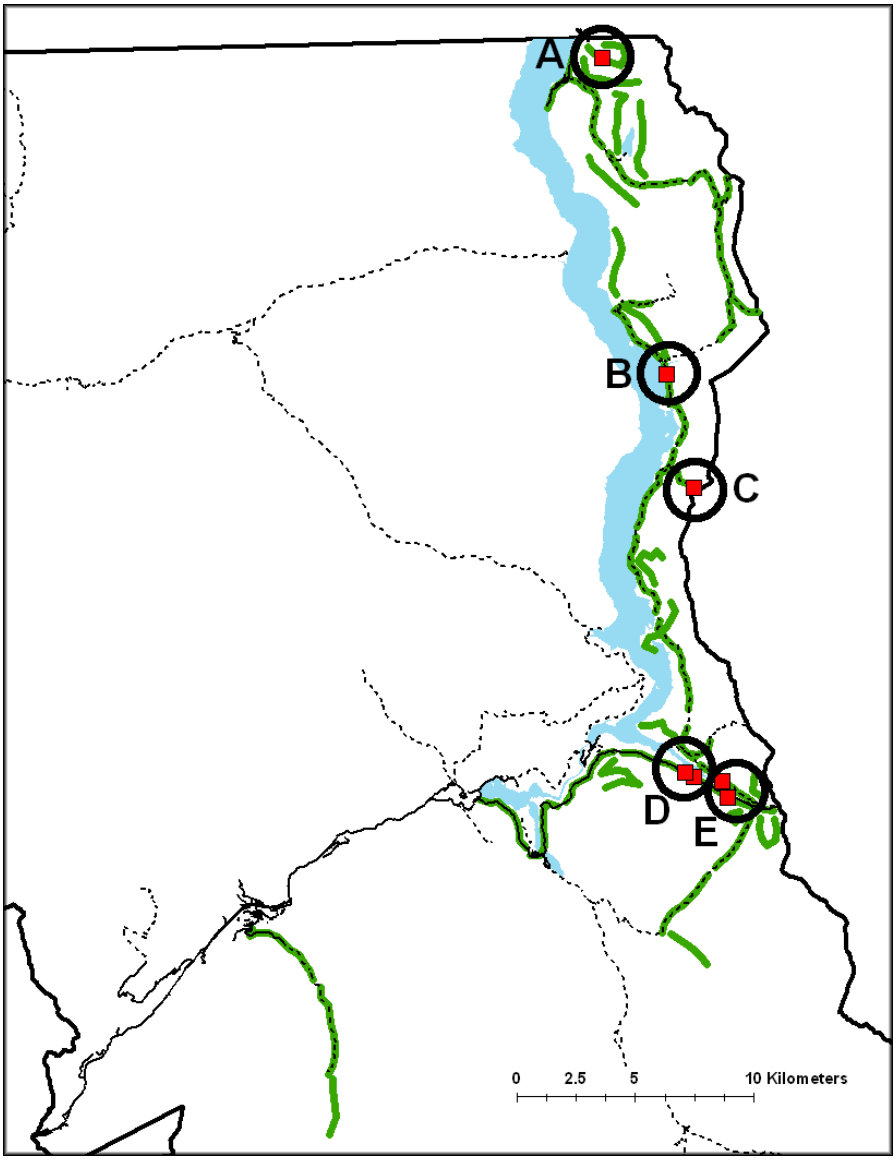

Figure 7. Location of Northern Saw-whet Owl detections (red squares) recorded during the 2009 Spotted Owl survey in North Cascades National Park. Lettered black circles group the detections according to our best guess of the number of distinct territories represented by the detections, but are not intended to indicate territory size; see Table 6 for more information. Green lines indicate Spotted Owl survey transects; dashed black lines indicate trails; thin black lines indicate roads; thick black lines indicate park boundaries.

Transects surveyed

Below we provide an annotated list of all transects surveyed in 2009. The average elevation of the survey stations along each transect is provided in parentheses, along with the dates the transect was surveyed. Transect locations are indicated in Figure 8 (northern half of the Ross Lake drainage), Figure 9 (southern half of the Ross Lake drainage, plus the Panther Creek, Ruby Creek, and Thunder Creek drainages), and Figure 10 (Newhalem Creek drainage).

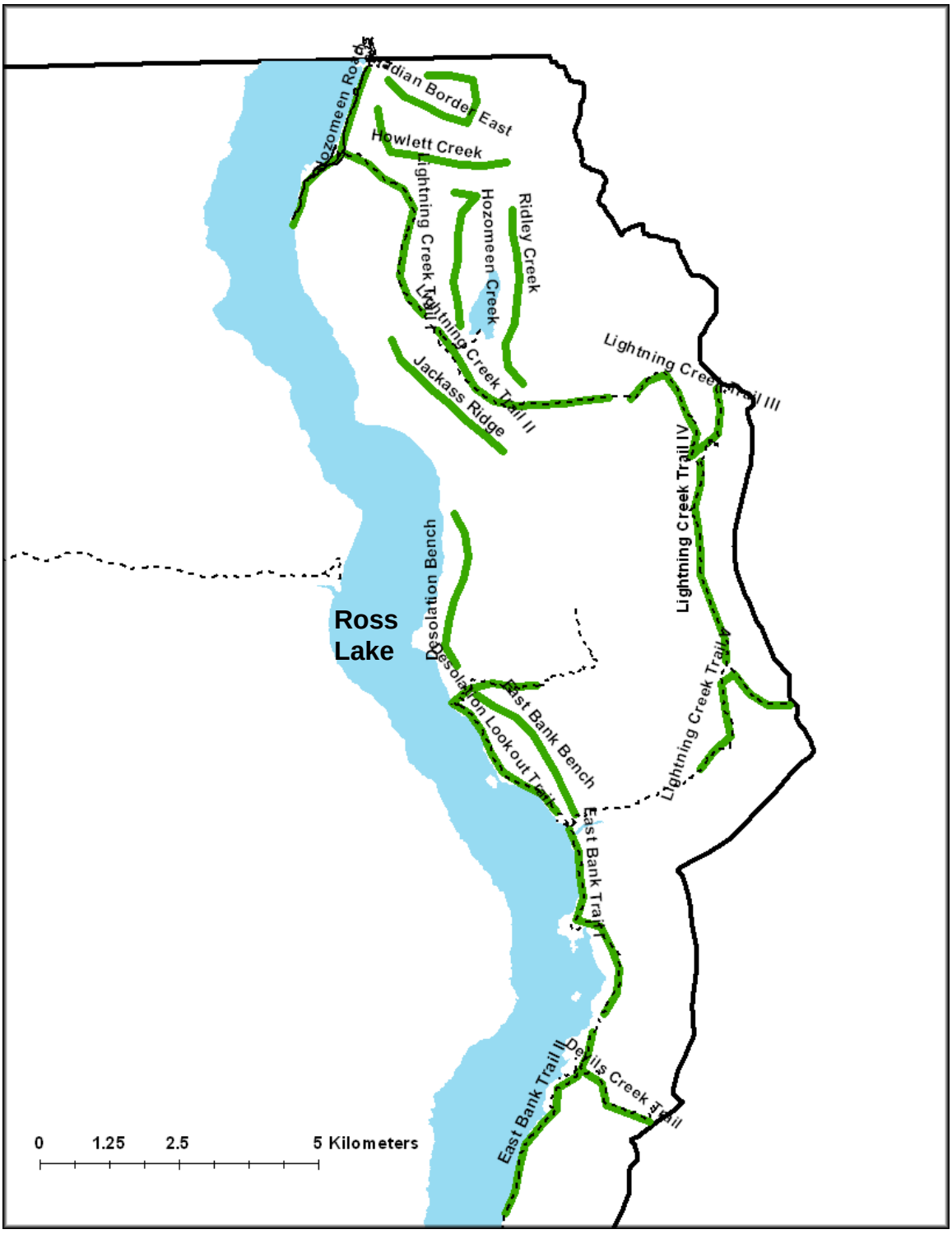

Figure 8. Northernmost transects (green lines with labels) in the Ross Lake drainage surveyed for Spotted Owls during the 2009 field season in North Cascades National Park. Dashed black lines indicate trails; thin black lines indicate roads; thick black lines indicate park boundaries.

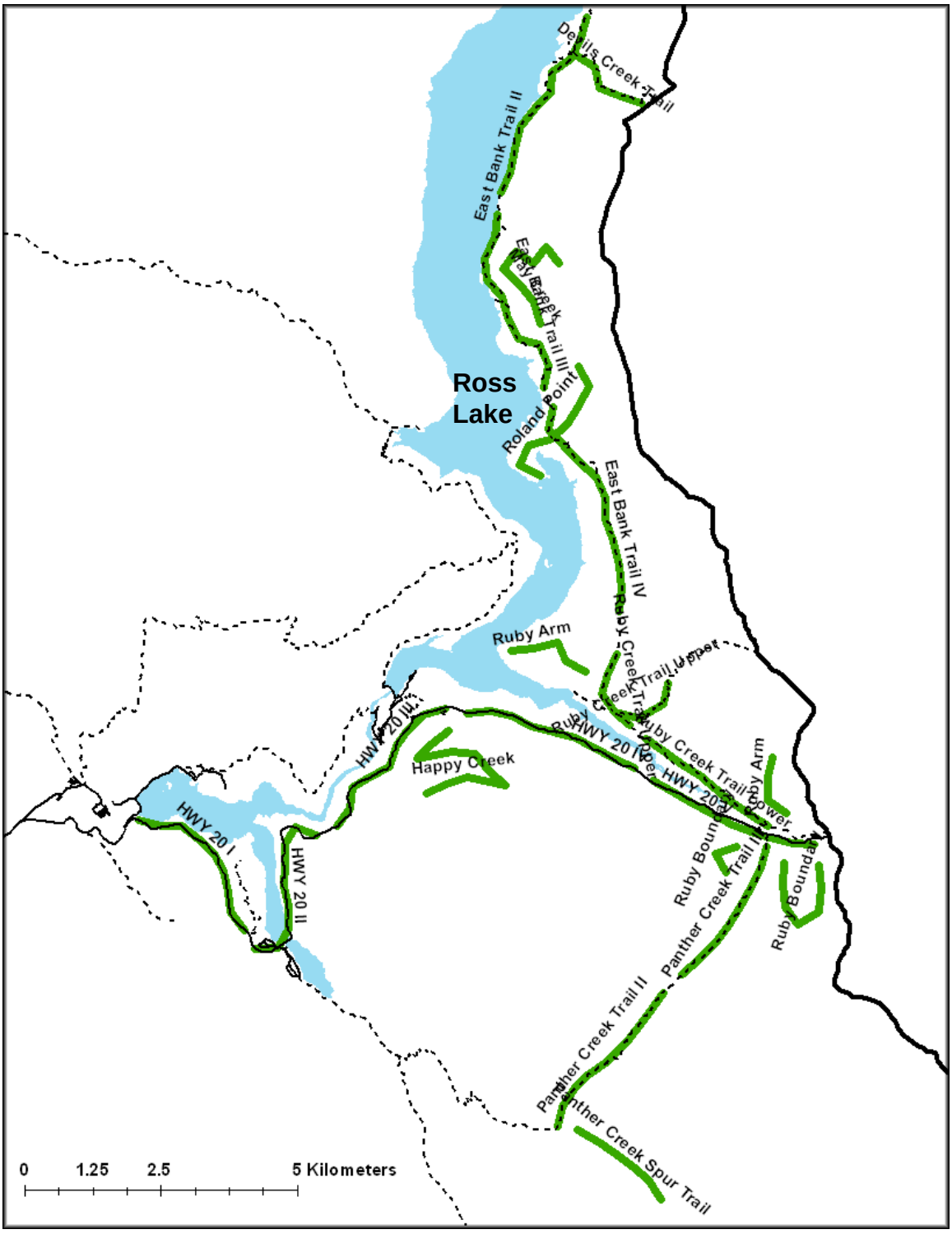

Figure 9. Transects (green lines with labels) in the Panther Creek, Ross Lake (southern portion only), Ruby Creek, and Thunder Creek drainages surveyed for Spotted Owls during the 2009 field season in North Cascades National Park. Dashed black lines indicate trails; thin black lines indicate roads; thick black lines indicate park boundaries.

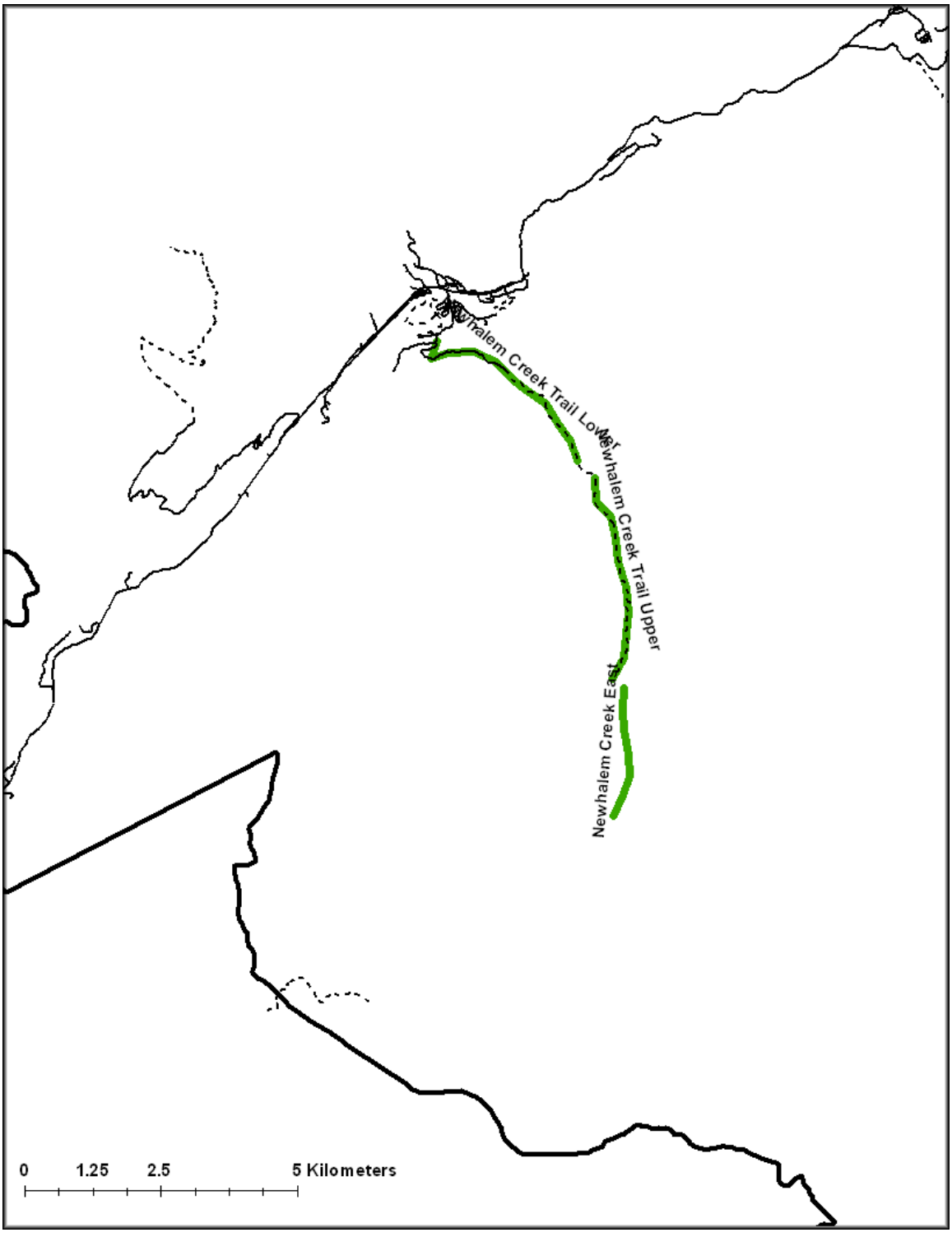

Figure 10. Transects (green lines with labels) in the Newhalem Creek drainage surveyed for Spotted Owls during the 2009 field season in North Cascades National Park. Dashed black lines indicate trails; thin black lines indicate roads; thick black lines indicate park boundaries.

Canadian Border East
(785 m; surveyed May 17 and June 14, 2009) We detected a Northern Saw-whet Owl at station 3.0 during our first visit. We also detected a pair of Barred Owls during our first visit, first incidentally while hiking to the start point, and then again during the survey at station 1.5. We believe this pair is the same pair identified on the Hozomeen Road transect.

Desolation Bench
(636 m; surveyed April 23 and June 2, 2009) During our second visit, we detected a Barred Owl at station 7.5 (we also detected a Northern Goshawk at station 3.5).

Desolation Lookout Trail
(658 m; surveyed April 22 and May 31, 2009) We detected no owls of any species on this transect.

Devils Creek Trail
(765 m; surveyed April 26 and June 3, 2009) We recorded an incidental detection of a Northern Saw-whet Owl during the first visit. During the second visit we detected a pair of Barred Owls at station 3.0. The field crew noted that this could be the same pair detected on the East Bank Trail II transect.

East Bank Bench
(727 m; surveyed April 22 and June 1, 2009) We detected a Barred Owl during our first visit at station 6.0. The crew believed the owl was female, though they were not certain. Two Northern Pygmy-Owls were detected, calling in chorus, on the second visit at stations 1.0 and 1.5.

East Bank Trail I
(532 m; surveyed April 15 and May 31, 2009) We detected a Northern Saw-whet Owl during our first visit. During the second visit, we detected a Barred Owl at station 4.0.

East Bank Trail II
(531 m; surveyed April 15 and June 3, 2009) We detected a Barred Owl pair during the first visit at station 12.0. There were also three incidental Barred Owl detections made from the Devils Creek Campground, near station 13.0, on various dates throughout the survey season.

East Bank Trail III
(526 m; surveyed April 14 and June 4, 2009) We detected a Barred Owl pair during both the first and second visits at station 24.0. Additionally, during the second visit we heard a fledgling Barred Owl giving the juvenile hissing call.

East Bank Trail IV
(632 m; surveyed April 4 and April 14, 2009) We detected two Barred Owls during the first visit, one at station 36.5 and the other at station 40.0. Three Barred owls were detected during the second visit—a pair at station 40.0 and a single detection at station 31.0. The owl at station 31.0 was likely one of the same birds detected on the Roland Point transect.

Happy Creek
(936 m; surveyed May 4 and June 10, 2009) The field crew noted that this transect crosses through particularly good Spotted Owl habitat, with mature stands of Western Redcedar and

Douglas-fir. We detected a Barred Owl at station 6.0 during the first and second visits. During the second visit, another Barred Owl, believed to be female, was also detected at station 9.0.

Highway 20 I

(429 m; surveyed April 2, April 11, and April 25, 2009) We detected a pair of Barred Owls during the first visit at station 8.5, near the south end of Thunder Lake (Thunder Lake activity site in Table 3). During the second visit, we heard a single Barred Owl calling from across Diablo Lake on the north side of Diablo Dam. This likely represents an additional activity site (Highway 20 I activity site in Table 3), distinct from the pair detected during the first visit.

Highway 20 II

(451 m, surveyed April 3, April 11, and April 24, 2009) We detected one Barred Owl, likely a member of the pair detected on the Highway 20 I transect, during our first visit.

Highway 20 III

(620 m; surveyed April 3, April 11, and April 23, 2009) We detected a male Barred Owl at station 26.0 during our first visit. The owl was likely a member of the pair detected on the Happy Creek transect.

Highway 20 IV

(661 m; surveyed April 4, April 11, and April 22, 2009) We detected a Northern Saw-whet Owl during each visit, ranging between stations 36.0 and 35.0. We also recorded three Barred Owl detections along this transect. During our first visit we detected Barred Owls at stations 29.0 and 31.0, though it was unclear if these detections represented a single owl that had moved or two distinct owls. During our second visit, the detection was recorded at station 28.0. The crew believed all three detections to be the same birds detected on the Happy Creek transect.

Highway 20 V

(607 m; surveyed April 4, April 21, and May 5, 2009) We detected a Northern Saw-whet Owl at station 40.0 during our first visit. The crew believed this detection to be unrelated to the detection on the Highway 20 IV transect because the two detections were recorded 1,600 m apart on the same night.

Howlett Creek

(770 m; surveyed May 16 and June 10, 2009) We detected a Northern Pygmy-Owl during the first visit at station 7.0.

Hozomeen Creek

(808 m; surveyed May 15 and June 11, 2009) We detected no owls of any species while surveying this transect, but recorded several incidental owl detections in the general area. While hiking towards the start point of the transect for our second visit, we saw an unidentified *Strix* owl fly overhead near station 1.0. The owl was unresponsive to our hooting. We recorded three incidental Barred Owl detections later that night, including a confirmed pair approximately 400 m southeast of station 1.0 at the Hozomeen Lake campground. Because of the proximity to the location of the Lightning Creek II Barred Owl pair, we believe the Hozomeen Creek detections were likely the same pair.

Hozomeen Road
(504 m; surveyed May 12 and May 16, 2009) We detected a Barred Owl at station 4.0 during our first visit. The presence of a Barred Owl pair was confirmed with seven incidental detections recorded from the Hozomeen bunkhouse near station 5.0 on various dates.

Jackass Ridge
(1,110 m; surveyed June 13, 2009) We visited this transect only once, and detected no owls of any species.

Lightning Creek Trail I
(720 m; surveyed May 11 and May 14, 2009) We recorded three Barred Owl detections during our first visit. An individual Barred Owl was recorded at station 6.5 and the Hozomeen Road pair was detected from station 1.0. During the second visit, we detected a Barred Owl at station 5.5. We recorded an incidental Western Screech-Owl detection near station 6.5 prior to each survey visit.

Lightning Creek Trail II
(857 m; surveyed May 12 and June 24, 2009) During the first visit, we detected a Barred Owl at station 16.0, and an unidentified owl was recorded incidentally from the Willow Lake campground near station 19.0. During our second visit, heavy rain prevented survey of stations 14.0 and 15.0-20.0.

Lightning Creek Trail III
(813 m; surveyed May 13 and June 23, 2009) We detected no owls of any species along this transect. During the first visit, heavy rain prevented the survey of stations 21.0-25.5. During the second visit, loose debris and the risk of a rockslide prevented the survey of stations 28.0-30.0.

Lightning Creek Trail IV
(645 m; surveyed April 25 and June 22, 2009) We detected no owls of any species along this transect.

Lightning Creek Trail V
(689 m; surveyed April 24 and June 21, 2009) During our second visit, we detected a Barred Owl at station 46.5. Two other Barred Owl detections were recorded near stations 44.0 and 45.0. All detections may have been of the same individual Barred Owl.

May Creek
(806 m; surveyed May 2 and June 4, 2009) We detected no owls of any species on this transect. The transect covers steep, rugged terrain requiring bouldering over small cliffs and traversing steep slopes with loose rock—the survey crew recommended omitting it from future surveys out of safety concerns.

Newhalem Creek East
(742 m; surveyed May 24 and June 12, 2009) During the second visit, we found an owl pellet, approximately 5 cm long and containing bones of a squirrel or other large rodent, at station 3.5. Later, we detected a Barred Owl and a Northern Pygmy-Owl near station 3.5 during a historical follow-up visit after transect surveys were completed. We grouped the Barred Owl detection on this transect with the Newhalem Creek Upper activity site (Table 3).

Newhalem Creek Trail Lower
(297 m; surveyed April 13 and May 2, 2009) We detected no owls of any species along this transect.

Newhalem Creek Trail Upper
(520 m; surveyed May 23 and June 11, 2009) During transect surveys, we recorded two Barred Owl detections on this transect, one near station 19.5 during our first visit, and the other at station 21.0 during the second visit. The observer of the first Barred Owl detection may have also heard a second Barred Owl near the same station, but noise interference from Newhalem Creek prevented positive pair confirmation. The Newhalem Creek Trail is no longer maintained by the park. In the early season high snow made it easily passable, but by mid June the snow had largely melted and dense brush made for very difficult traveling. For logistics and planning purposes, the transect should be treated as on off-trail transect in the future.

Panther Creek Trail II
(888 m; surveyed May 25, 2009) We detected a single Barred Owl while surveying this transect; positive pair status was later confirmed from the 4th of July Pass campground near station 10.0.

Panther Creek Trail III
(640 m; surveyed May 3, May 21, and June 14, 2009) We detected no owls of any species on this transect.

Panther Creek Spur Trail
(911 m; surveyed May 26, 2009) We detected no owls of any species on this transect. The field crew noted that much of habitat seemed particularly suitable for Spotted Owls, with many old growth stands of Western Redcedar and Western Hemlock.

Ridley Creek
(976 m; surveyed June 12, 2009) We detected a Barred Owl at station 2.0, likely a member of the same pair detected on Lightning Creek Trail II.

Roland Point
(596 m; surveyed April 17 and June 5, 2009) During our first visit, we detected a Northern Pygmy-Owl at station 7.5 and a Great Horned Owl at station 3.0. During the second visit, we detected a Barred Owl pair at station 3.0.

Ruby Arm
(749 m; surveyed April 6, 2009) We surveyed this transect only once, and even then omitted stations 6.0-9.0, due to safety concerns stemming from a recent discovery of a nearby marijuana growing operation. We detected a Barred Owl and a Northern Pygmy-Owl at station 1.0. We grouped this Barred Owl detection with the East Bank Trail IV activity site.

Ruby Boundary
(919 m; surveyed May 6 and May 22, 2009) We detected no owls of any species on this transect.

Ruby Creek Trail Lower
(574 m; surveyed April 4 and May 3, 2009) We detected a Northern Saw-whet Owl at station 5.5 during the first visit; it called continuously throughout the night and was heard at subsequent

survey stations. During the second visit we detected a single Barred Owl at station 4.0, and also recorded an incidental Northern Pygmy-Owl detection near station 5.5.

Ruby Creek Trail Upper

(739 m; surveyed May 1, 2009) We detected no owls of any species during our survey of this transect. However, we recorded three incidental owl detections along the survey route on the night of April 6, 2009: a Barred Owl near station 13.0, and then another Barred Owl (possibly the same individual) and a Western Screech-Owl from the Hidden Hand campground near station 11.0. These Barred Owl detections were grouped as part of the East Bank Trail IV pair activity site (Table 3).

Stillwell Creek

(1,057 m; surveyed May 27, 2009) We detected no owls of any species along this transect. Due to difficult, steep terrain, the crew did not survey stations 4.5 through 8.0, and relocated stations 3.0 and 3.5 to safer terrain closer to Stillwell Creek. With the historical bridge missing on Panther Creek, the hiker camp was inaccessible and this transect was conducted as a day trip from Diablo, adding another five miles of hiking needed to complete the transect survey. The crew recommended omitting this transect from future survey effort.

Discussion

We have completed only half of our survey work on this two-year project to survey the upper Skagit River watershed within NOCA, so reaching conclusions about changes in the distribution or abundance of owls in the study area is premature. Nevertheless, two preliminary findings are striking:

1. One historical Spotted Owl territory no longer appears to be occupied.

2. Since the previous extensive owl survey was completed in 1996, Barred Owls have densely colonized the east side of Ross Lake. We found perhaps 11 Barred Owl activity sites east of Ross Lake and north of Highway 20, compared with just 3 activity sites identified in this area during the early 1990s (Kuntz and Christopherson 1996).

Indeed, these two findings may be related, as there is now a Barred Owl activity site with detections centered at the historic Spotted Owl territory that no longer appears to be occupied. Throughout the Pacific Northwest and British Columbia, Barred Owls are known to be displacing Spotted Owls (Dunbar et al. 1991, Hamer et al. 1994, Kelly et al. 2003, Peterson and Robbins 2003). Recent research has indicated that colonization of an area by Barred Owls has negative consequences for Spotted Owls (Hamer et al. 2007), (although, notably, Bailey et al. 2009 found no supporting evidence), including accelerated population declines (Kelly et al. 2003), increased probabilities of local extinction and decreased probabilities of colonization (Olson et al. 2005), and reduced nesting productivity (Olson et al. 2004).

Bailey et al. (2009) reported that the probability of detecting a Spotted Owl while conducting a follow-up visit to an occupied territory may be reduced if Barred Owls are present. However, even taking this factor into account, Bailey et al. (2009) estimated average detection probability during a single follow-up visit to an occupied territory to be somewhere around 0.6, which would yield a cumulative detection probability of 99.6% over the 6 follow-up visits we conducted.

Plans for the 2010 field season

During the 2010 breeding season we will complete our survey efforts in the upper Skagit River watershed within NOCA, after which we can make firmer conclusions about the status of Spotted Owl in the area, and develop management plans for historical and current Spotted Owl activity sites. Additionally, now that we know that the historic Newhalem territory was occupied in 2009, we will commit whatever resources are necessary to relocate the owl or owls at the site in 2010, and if there is a nest, to locate it and monitor breeding effort. Our survey work next year will be important in revealing whether the apparently dramatic increase in Barred Owl density since the early 1990s has been restricted to the east side of Ross Lake, or whether it has been a more pervasive phenomenon throughout the west slope of NOCA.

Literature Cited

Anthony, R. G., E. D. Forsman, A. B. Franklin, D. R. Anderson, K. P. Burnham, G. C. White, C. J. Schwarz, J. Nichols, J. E. Hines, G. S. Olson, and others. 2004. Status report to the Interagency Regional Monitoring Program, Portland, OR.

Bailey, L. L., J. A. Reid, E. D. Forsman, and J. D. Nichols. 2009. Modeling co-occurrence of northern spotted and barred owls: Accounting for detection probability differences. Biological Conservation 142:2983-2989.

Dunbar, D. L., B. P. Booth, E. D. Forsman, A. E. Hetherington, and D. J. Wilson. 1991. Status of the spotted owl, *Strix occidentalis*, and barred owl, *Strix varia*, in southwestern British Columbia. Canadian Field-Naturalist 105:464-468.

Forsman, E. D. 1983. Methods and materials for locating and studying spotted owls. USDA Forest Service, General Technical Report PNW-162.

Gutiérrez, R. J., A. B. Franklin, and W. S. LaHaye. 1995. Spotted owl (*Strix occidentalis*). *In* The birds of North America, No. 179 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C.

Hamer, T. E. 1988. Home range size of the northern barred owl and northern spotted owl in Western Washington. M.S. Thesis. Western Washington University, Bellingham, WA.

Hamer, T. E., E. D. Forsman, A. D. Fuchs, and M. L. Walters. 1994. Hybridization between barred and spotted owls. The Auk 111: 487-492.

Hamer, T. E., E. D. Forsman, and E. M. Glenn. 2007. Home range attributes and habitat selection of barred owls and spotted owls in an area of sympatry. The Condor 109:750-768.

Kelly, E. G., E. D. Forsman, and R. G. Anthony. 2003. Are barred owls displacing spotted owls? Condor 105:45-53.

Kuntz II, R. C. and R. G. Christophersen. 1996. A survey of northern spotted owls in North Cascades National Park Service Complex. Technical Report NPS/CCSONOCA/NRTR-96/05.

Olson, G. S., R. G. Anthony, E. D. Forsman, S. H. Ackers, P. J. Loschl, J. A. Reid, K. M. Dugger, E. M. Glenn, and W. J. Ripple. 2005. Modeling site occupancy dynamics for northern spotted owls, with emphasis on the effects of barred owls. Journal of Wildlife Management 69: 918-932.

Olson, G. S., E. M. Glenn, R. G. Anthony, E. D. Forsman, J. A. Reid, P. J. Loschl, and W. J. Ripple. 2004. Modeling demographic performance of northern spotted owls relative to forest habitat in Oregon. Journal of Wildlife Management 68:1039-1053.

Pearson, R. R. and K. B. Livezey. 2003. Distribution, numbers, and site characteristics of spotted owls and barred owls in the Cascade Mountains of Washington. Journal of Raptor Research 37:265-276.

Peterson, T. and C. R. Robbins. 2003. Using ecological-niche modeling to predict barred owl invasions with implications for spotted owl conservation. Conservation Biology 17:1161-1165.

Seaman, D. E., R. J. Frederickson, D. B. Houston, B. B. Moorhead, and R. A. Hoffman. 1992. Northern spotted owl inventory - Olympic National Park. National Park Service, Olympic National Park.

Siegel, R. B., K. E. Jablonski, M. N. Scholer , R. C. Kuntz II, and R. L. Wilkerson. 2008. Surveying for spotted owls on the east slope of North Cascades National Park Service Complex, 2007-2008. Natural Resource Technical Report NPS/NCCN/NRTR—2008/000. National Park Service, Fort Collins, Colorado.

Thomas, J. W., E. D. Forsman, J. B. Lint, E. C. Meslow, B. R. Noon, and J. Verner. 1990. A conservation strategy for the northern spotted owl. Report of the Interagency Scientific Committee to address the conservation of the northern spotted owl. U.S. Government Printing Office 1990:791-171/20026.

U.S. Department of the Interior, Fish and Wildlife Service. 1990. Endangered and threatened wildlife and plants; determination of threatened status for the northern spotted owl, final rule. Washington D.C. Federal Register 55 (123):26114-26194.

U.S. Department of the Interior, Fish and Wildlife Service. 1992. Protocol for surveying proposed management activities that may impact northern spotted owls. Unpublished report.

U.S. Department of the Interior, Fish and Wildlife Service. 2007. 2007 Draft recovery plan for the northern spotted owl, *Strix occidentalis caurina*: merged options 1 and 2. Portland, OR.

Wilkerson, R. L. and R. B. Siegel. 2007. Interpreting the northwest forest plan's northern spotted owl habitat suitability model for use in North Cascades National Park. The Institute for Bird Populations, Point Reyes Station, CA.

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